

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
12 February 2004 (12.02.2004)

PCT

(10) International Publication Number  
**WO 2004/012597 A1**

- (51) International Patent Classification<sup>7</sup>: **A61B 5/085**
- (21) International Application Number:  
PCT/US2003/024188
- (22) International Filing Date: 1 August 2003 (01.08.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
60/400,038 2 August 2002 (02.08.2002) US
- (63) Related by continuation (CON) or continuation-in-part (CIP) to earlier application:  
US 60/400,038 (CIP)  
Filed on 2 August 2002 (02.08.2002)
- (71) Applicant (for all designated States except US): **WAYNE STATE UNIVERSITY** [US/US]; 4249 Faculty/Administration Building, 656 West Kirby, Detroit, MI 48202 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **BADR, M., Safwan** [US/US]; 1780 Alder Drive, West Bloomfield, MI 48324

(US). **MANSOUR, Khaled, F.** [US/US]; 6210 Jonathon, Dearborn, MI 48126 (US). **ROWLEY, James, A.** [US/US]; 4163 Old Dominion Drive, West Bloomfield, MI 48323 (US). **SHKOUKANI, Mahdi, A.** [JO/US]; 52634 Sawmill Creek, Macomb Township, MI 48042 (US).

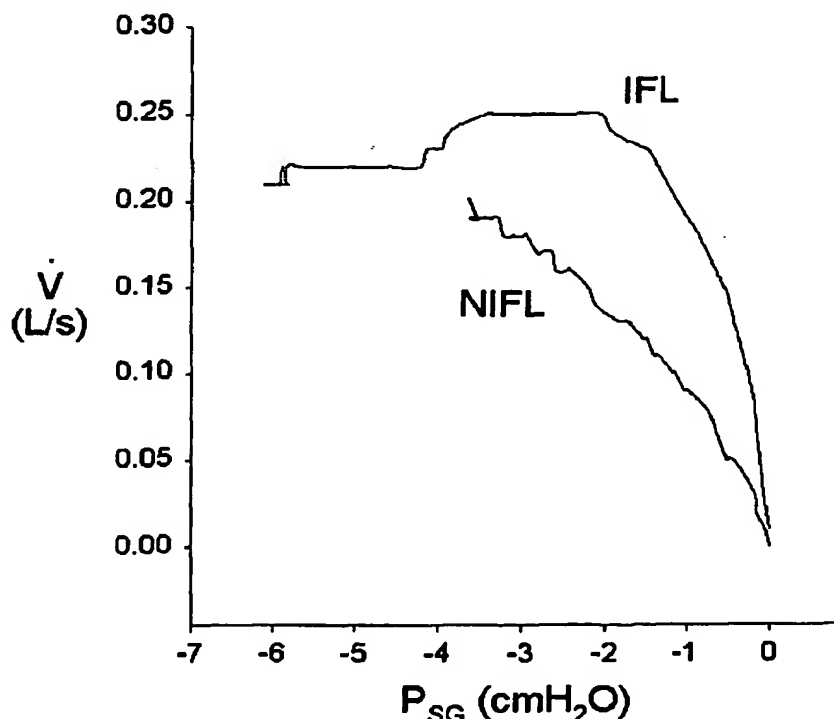
(74) Agents: **ROHM, Benita, J.** et al.; Rohm & Monsanto, PLC, 660 Woodward Avenue, Suite 1525, Detroit, MI 48226 (US).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,

[Continued on next page]

(54) Title: SYSTEM FOR DIAGNOSING AND TREATING SLEEP APNEA



(57) Abstract: Two programs measure upper airway resistance using Resistance = Pressure/Flow. Raw flow and pressure data is divided into breaths and time adjusted so each breath starts with the value zero. Each breath is graphed as flow in the y-axis and time in the x-axis. The slope between points Flow =0 and Flow=0.20 is calculated. The resistance is the inverse of the slope. The second program determines whether a breath is flow limited or not. It also uses the flow and time data to perform a curve fitting to describe the flow-time in meaningful polynomial function  $F(P) = A P^3 + B P^2 + C P + D$ . The derivative of this function is  $F' = 3AP^2 + 2BP + C$ . If the value of the derivative  $F'$  at maximum flow is less than or equal zero, then it is a flow limited breath, otherwise, it is non flow limited breath. Also, the need for a pressure-monitoring catheter is obviated.



SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**Published:**

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*